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The Trend Analysis of Transport Development in Slovak Republic

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Abstract

The paper is devoted to the current state and conditions of road and railway transport in the Slovak Republic, including selected indicators. Through the use of indicators analysis is identified the trend and on the basis of the trends is possible to determine the forecast of future development. Trend statement presents a key factor to successful decision-making in the future.

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Keywords: trend analysis, road transport, railway transport, indicators, infrastructure, passengers

1. Introduction

According to Lizbetin (2007), the transport is an intentional movement of vehicles along traffic routes or operation of traffic facilities, which the transfer takes place." Each type of traffic is unique in its own way. It uses different means of transport respectively transportation equipment carried by traffic routes. In dependence on the pattern of traffic route and vehicles, the transport is divided into: rail, road, inland waterway, sea, air, unconventional (tube, etc.).

Nowadays, the transport is an integral part of our everyday lives. Its continual development and growth is influenced by various factors, whether positive or negative. These factors can be modified by analysis and determination the prediction of the next stage of development.

The transport in Slovakia started most developed with EU accession. Construction, modernization and correction of transport infrastructure are mainly financed from European funds but also from state resources. Slovakia, as a

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member state, is obligatory to concentrate its available resources on the basic network and the priority projects, which have been defined by the European Parliament and the Council n.884/2004.

Development of individual transport sector has long been uneven. Imbalance in the system due to various factors, therefore, it is necessary to pay special attention to those problems and try to solve them.

1.1. Factors affecting the transport development

Zeleny et al. (2008) defined these factors that affect the transport development:

- Political aspects: the method of encouragement has crucial influence on the transport development and transport structure;
- Economic aspects: greater economic development evokes the expansion of transport sector and thus increases the rate of accessibility to places and sources of economic growth;
- Technical aspects: progress in technical area focuses on performance increasing, on efficiency of vehicles utilization, on reducing ill-effects and on standardization and safety;
- Social aspects: all changes related to standardization of living conditions and degradation of cultural barriers in European society;
- Environmental aspects: are considered to be primary and decisive. They affect other areas, either directly or indirectly;
- Migration: an effect which arose as a result of continuing economic and social disparities. Migration complicates the transport development in all its forms with the growing demands on accessibility and quality of transport;
- City development: most of large cities formed the centers of economic development due to the progress and development of most sectors;
- Mobility development: it is characterized not only by growth and also by significant progress in dynamics holders.

1.2. Road and railway transport

The road transport is the most used and the most advanced form of the transportation in Slovakia. It is important for economic development and growth of living standard. But the infrastructure density in compare with EU countries is still average.

According to Transport Development Strategy of the Slovak Republic in 2020 (2010), motorways and expressways provide the traffic connection among the important points in the country, but also the highway approach to the neighboring countries. They are built mostly on the routes with the highest traffic load. The current situation is characterized by insufficient coverage area and access in the network of motorways and expressways in a period longer than 45 minutes. As the result is the economic development unbalance between growths in traffic demands, which represents an unacceptable environment for foreign investors. The situation is changing by the construction of new motorways and expressways in the relevant sections.

Also the railway transport plays an important role in the transport market in national and international benchmark. It thereby supports the business connections and common relations by established physical connections within the state and the EU.

The current railway infrastructure consists of neglected high density network and outdated technologies and wagon stocks. It handicaps wider utilization in the transport market. Her performances are relatively low and the capacity of existing railroads is low-used.

The main objective of paper is on the basis of selected indicators of road and railway transport development in Slovakia, prepared by the Statistical Office of the Slovak Republic, Slovstat database, Eurostat database and Road Databank, to determine the prediction of further development.

2. Methodology

By applying the trend analysis in road and railway transport in the Slovak Republic the trend is determined. Trend expression is a key factor to successful decision-making in future activities.

For creating an appropriate model of trend in the future, it is necessary to dispose of large data number. If the data are a few and unstable, development forecast is creating very difficult and it is often vagueness.

Accessible data about individual indicators have different space of time length due to the inaccessibility of information. All indicators were generated for 5 years forecast. Analytical tools by Microsoft Excel were used for data processing. By graphically creating an alignment chart from those data is visually shown the type of function. For estimation the parameters of the type of function is necessary Regression, a tool which determines the course of dependence.

In words of Chajdiak (2005), output of Regression is a table ANOVA (Analysis of Variance), which says if the model is statistically appropriate. Determining factors are signification F (p-value – value must be less than 0.05, then the model is statistically appropriate), reliability R, which says what is the proportion of variability explained by the regression model. The point is that the sum of deviations of the observed facts was minimal. The value should be as close to one. Next factor takes into consideration indexes, where it is possible to help by the p-value which is assigned to each index.

3. Indicator of transport infrastructure

One of the basic tasks of transport infrastructure is to ensure mobility of people and goods through the use of wide traffic routes. Slovakia has for years trying to interface the network of transport infrastructures with international corridors. The network should then become some “gate” between East and West.

The indicator of transport infrastructure examines the length of traffic routes, i.e. the length of roads and railway lines.

Under roads and motorways are given the length of roads and motorways of nationwide importance (expressways and roads 1st, 2nd, 3rd class) including their parts in cities and communities included in road network.

Length of railway lines means the length of continuous lines. Other transport and sidings lines are excluded.

The most important transport infrastructure in Slovakia is the road network. The length of the roads was increased in years 2000-2012.

By Masarova & Sediva (2013), the length of motorways and feeder roads was increased by 138.8 km, i. e. by 43.3 %. The largest expansion recorded motorways, by increasing the length of more than 8-fold, which represent an increase of 221.3 kilometers. By contrast, decrease fall in roads 2nd class by 189.7 kilometers. The reason could be the integration of roads in another category, respectively discarding from evidence of the roads. 3rd class roads acquisition was moderate, only about 21km. The total length of roads has been increased by 306.8 km.

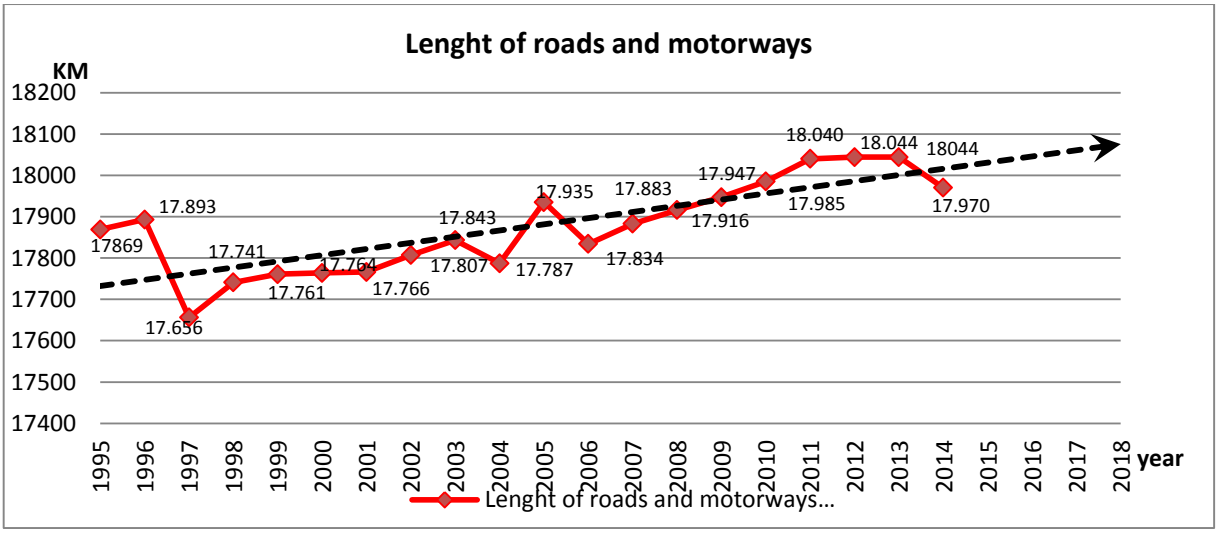

Fig. 1. Length of roads and motorways.

In the period 2007 – 2010 only less than half, i.e. 48.9 % of motorways and expressways were succeed to construct and start only one third, i.e. 32.6 % of roads that the government resolve to fulfill. In reality 250.9 km of motorways and expressways were devolved to use.

The main priority of the programme of the road network development has always been the completion of the motorways and expressways network. Despite these facts the first-class roads are still present substantial part of the road network, and therefore it should be given pay attention to them, mainly by reason of retrograde technical status, the accident rate and increasing traffic intensity.

Statistical data listed in the Slovak Road Administration database for the years 1995 to 2014, contain higher measured values as at the railways, but more unstable. Applied linear trend function, which was for this time line the best choice, predicts future growing development in the years 2015-2018. The trend is moving in the direction of the time series and the values are around the trend line relatively diffused in particular time periods. The reason may be a large number of planned, but unrealized projects, respectively delivery constructions after deadline.

Slovak railway infrastructure can be characterized by Statistical Office of the Slovak Republic (until 2002), Ministry of Transport, Construction and Regional Development of the Slovak Republic (since 2003) as relatively condensed, but outdated. Railway network consists of main lines and second lines. Their total length for the year 2012 was 3 631.4 km. Standard-gauged railways (3 451.6 km), narrow-gauged railways (50.1 km) and broad-gauged railways (98.7 km) belong here. In comparison with year 2000, it is recorded a drop by to 0.84 %. Single-track has a length of 2 583.3 km and double-track is 1 017.1 km, from that the electrified are 1 585.4 and non-electrified are 2 014.9 lines.

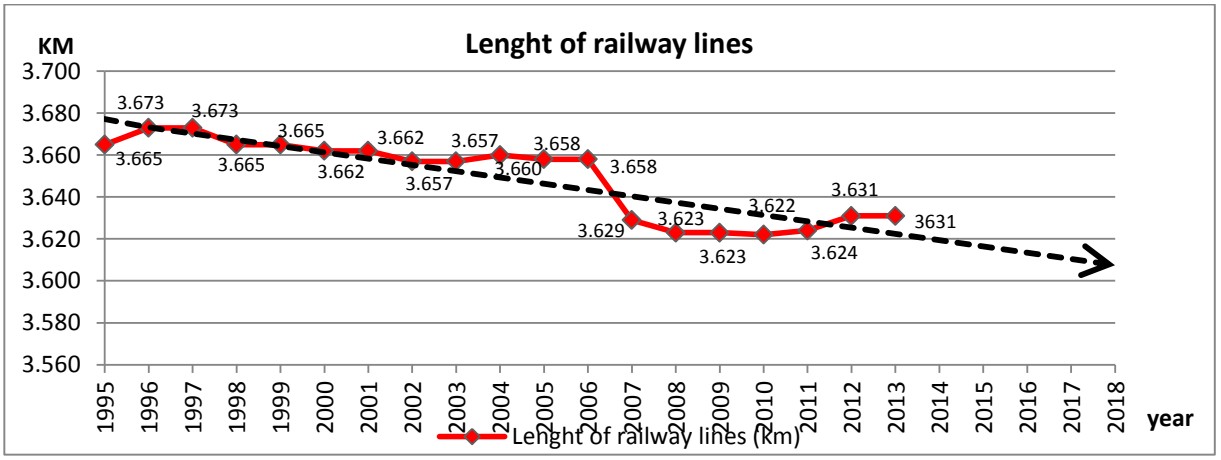

Fig. 2. Length of railway lines.

Descending values show the following time series of railways length in Slovakia from 1995 to 2013. The length of railways since 1996 has slowly declined. This decrease has not resulted in relay of the main lines, but lines which already did not fulfill its function for longer time; resp. after modernization the line was made more effective by shortening the length. The largest decrease in the length of lines, namely about 29 km was in 2006 – 2007. By graphical processing of an alignment chart, was defined the trend, which is expressed by a linear line. Future development forecast is shown in Figure 2. It can be expected that defined trend is correct, thanks to a sufficient range of data of the Statistical Office, Slovstat database and unvaried values.

Estimated trend descend slowly in the direction of railways length development. On the basis of these values, it can be stated that in 2018 the total length of railway lines in Slovakia should measure approximately 3607 km.

4. Indicator of freight transport performance

Freight transport is according to Luttmerdingova et al. (2013) contingent on development between Europe and Asia, liberalization and costs, e.g. for driving fuel. Performance of freight transport in overall terms, from 1999 to 2005, as compared to present is lower.

Performances of freight transport show the size of transportation outputs performed by freight vehicles of corresponding mode of transport.

Road freight transport controls a market with 76 % and railway freight transport has a 21 % share on freight transport market.

Performances in ton-kilometres present value of total transported performances in ton-kilometres carried out by freight transport means of particular kind of transport. They are calculated individually (tons x kilometres) for every journey individually

Transport of goods given in tons and performances given in ton-kilometres are surveyed according to the Classification of Goods in Transport NST 2007 which contains 20 commodity groups.

Road freight transport has the biggest share of the freight transport performance. It relates with the liberalization and removal of cross-border barriers. The constant increase is shown in Figure 3. The linear trend function was used for development prediction. Between 1999 and 2005 the values are moving below the trend, which may be caused by lower production of goods and services as at present.

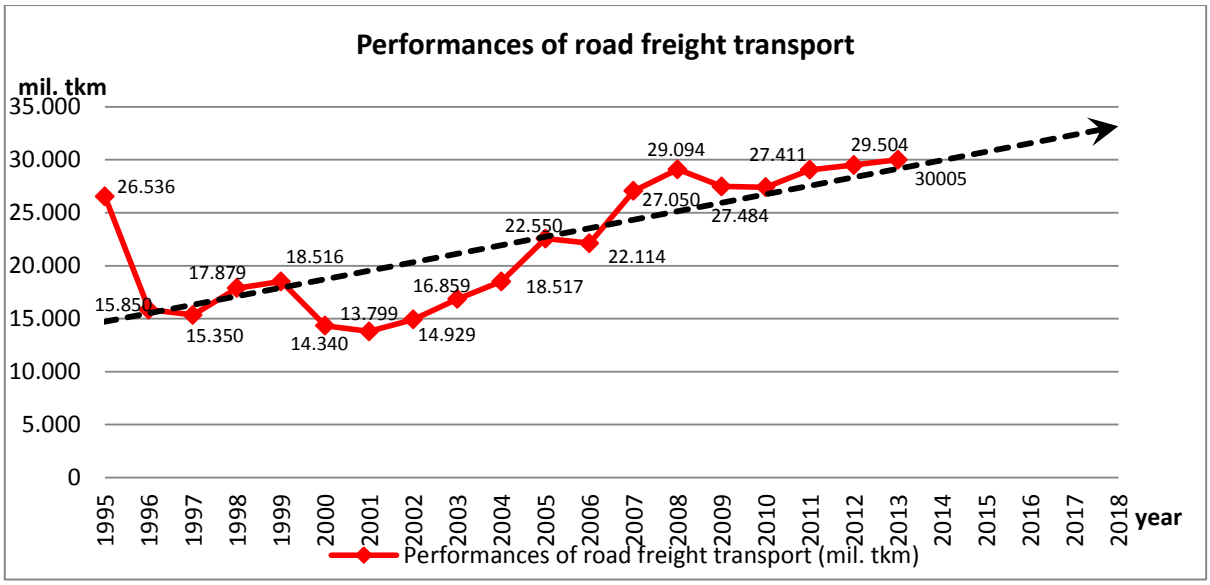

Fig. 3. Performances of road freight transport.

Designed trend may be affected by fuel price increase, as well as fixing new charges on the roads, e.g. electronic toll.

Performances of road freight transport have the variable character throughout all monitoring period with increase to year 2008, after this year, the performances decreased moderate and from 2011 they recorded a soft increase again.

Railway freight transport and its performances have continued in gentle downward trend since 2000. Railway freight transport has been fully liberalized in the year 2007.

In 2001, the fee for the using of rail freight transport was one of the highest in the European Union. The fee for a traffic route presented till 60% of the price. Only in the year 2011, the fee regarded level of variable costs, which motivated customers. The fee is therefore for the network access, for kilometres and gross weight.

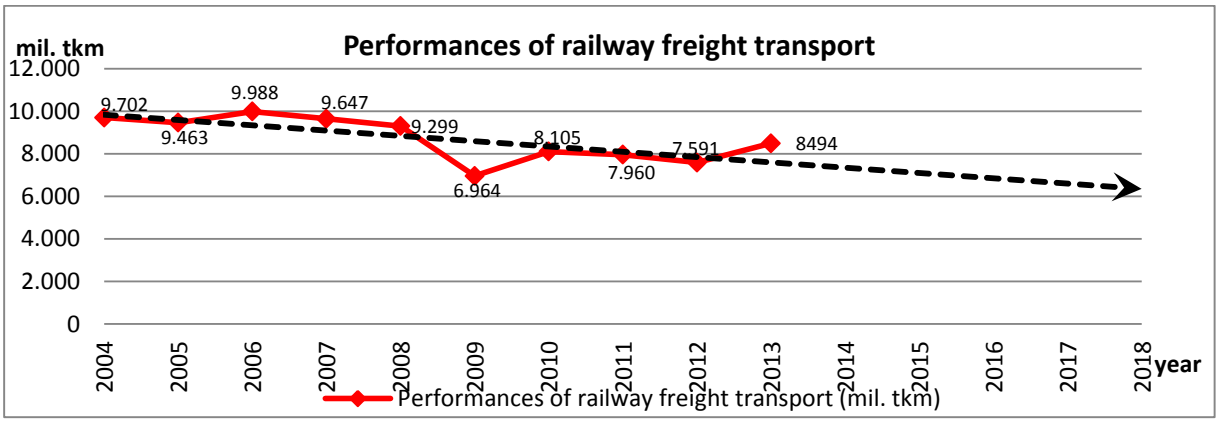

Fig. 4. Performances of railway freight transport.

Monitoring data from 2004 to 2013 and subsequently applying a suitable trend function, in this case a linear function, were indicated possible future development. On Figure 4 it is possible to see that the values of the time series are gently descending. The biggest decline was recorded in 2009, due to the economic and financial crisis, which began to manifest itself at the end of 2008. The fall was mainly in exported raw materials such as ironstone, coke, metal material, etc.

5. Indicator of transported persons

According to Masarova & Sediva (2013), the most widely used regular public transport is bus and railway passenger transport. The influence of individual motoring is very strong and it effect on the transport services demand. Gradually the number of transported persons using regular public transport decline, it also leads to increase in registered vehicles and environmental pollution.

This indicator inquires the number of passengers transported for each period using different mode of transport.

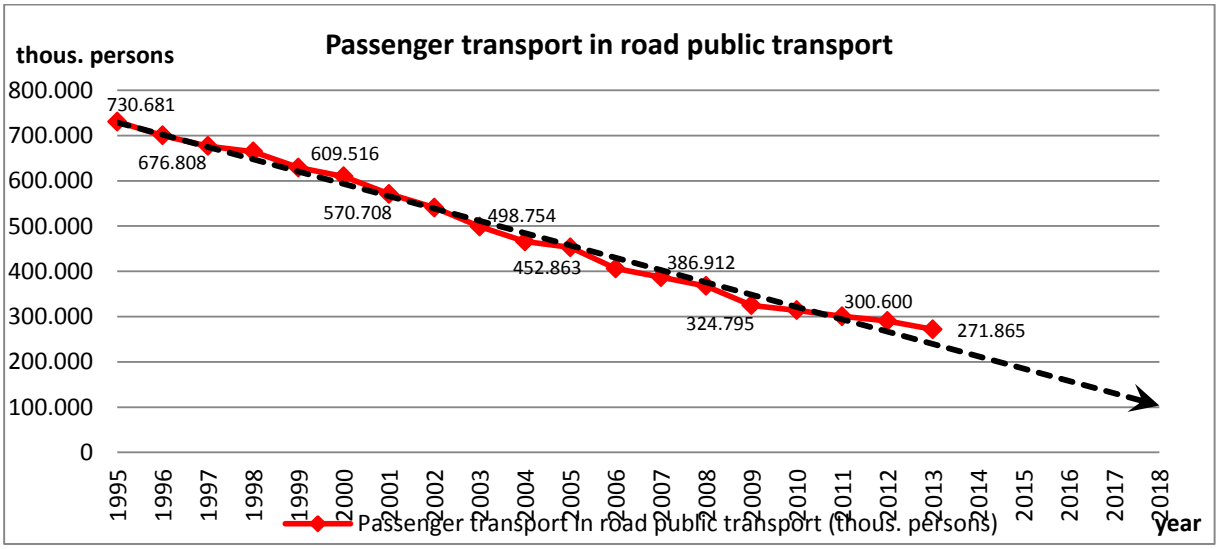

Fig. 5. Passenger transport in road public transport.

The future trend calculated by using a linear function, regression analysis, determines the future values of such data, e.g. that 185 113 people are transporting by road passenger transport in the year 2015.

Transfer by railway transport is becoming more and more unattractive to customers. Weaknesses of railways, as poor coordination, which makes the train delays, old and unsanitary railway wagons or insufficient speed of transport, are leaving the consequences. Moving values of the time series show a decreasing tendency. By application of regression model, the trend parameters of the linear function were founded and also its course for next five years.

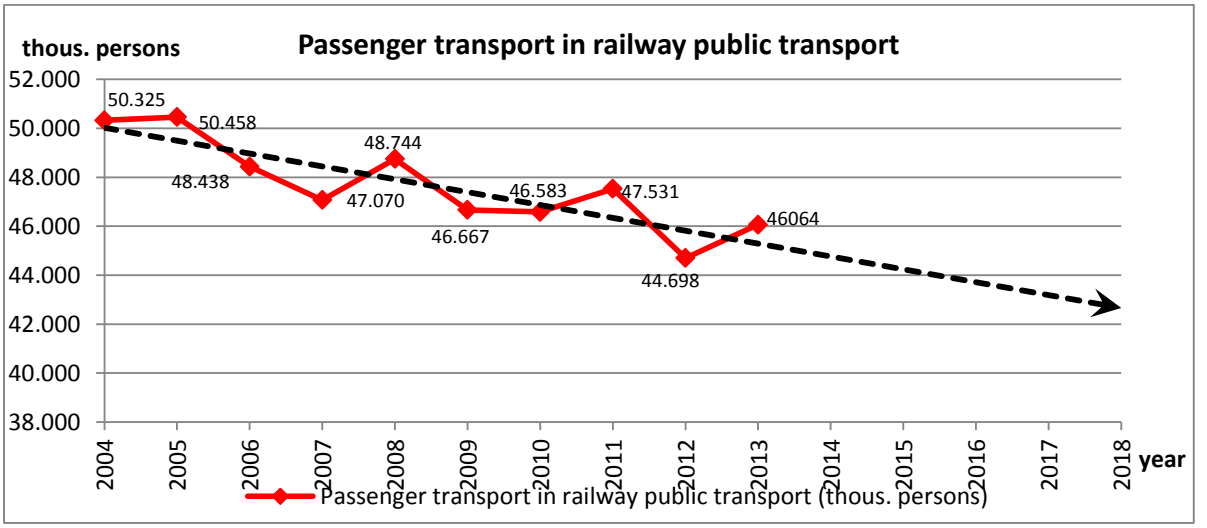

Fig. 6. Passenger transport in railway public transport.

Since 2012, the passenger railway transport market in Slovakia has been liberalized. The transports besides the state transport operator also provide competitive private companies (RegioJet, LEO Express). Private company RegioJet, which figures on the market longer, provides better additional services in the train. The state railway operator must care for a greater number of wagons and also other things. It is impossible to compete with such private companies. The state railway operator is trying to solve this problem by restructuring of lines and modernizing of tracks wagons, depending on available funding.

6. Conclusion

The most important part of freight transport in Slovakia is carried by road transport, which brings high-intensity of heavy goods vehicles on various sections of motorways, expressways, I. class roads, but also on some lower classes roads. With that, of course, related problems with the capacity of roads, emissions and noise, which it is necessary to solve them.

By living standard increasing also road automobile transport is expanding. As a result it is necessary to extend the capacity of the road network. Construction of motorways and expressways should help to decrease the congestion on the roads of lower class.

The construction of motorways is increasing, but not as would be expected. Slovakia has the smallest share of building motorways from all EU countries. The cause is poor planning of construction, or postponed terms and lack of funds.

Construction, modernization and reconstruction of transport routes are very demanding in terms of investment. The investments will be needed not only for building-up, but also for maintenance and repair of roads. If the maintenance and the repair will not made in time, the consequences would be reflected in the degradation of technical status, threat of serviceability, safety and they would lead to an unnecessary increase in future repair costs.

The overall improvement of economic situation of population, easier access to credit, falling prices of motor vehicles and social status are the factors, which affect the rising numbers of motor vehicles, and thereby also road passenger transport. It is also reflected in the reduction of public buses and railway transport and consequently in increasing their funding needs. The trend could be affected with lower prizes of tickets, improving accessibility of bus-stops, to knot of connections and intelligent transport system utilization.

Relatively low demand for passenger and freight railway transport and the risks of their further reduction are the main problems identified in the railway sector. From technical view, the problems are in parameters, facilities and state of the railway network and bad maintenance of vehicles.

It can say that the coverage of railway lines in Slovakia is sufficient. There is not demand for construction of railway lines currently. It is necessary to pay attention to the modernization of railway relays and to increases in their permeability.

On the basis of mathematical calculations, the downward trend was determined in all three selected indicators of railway transport. However, future real trend may be affected by mentioned political, economic, social and other factors. E.g. political decision - introduction of free transport for students and retirees from November 17th 2014, expects the increase of passengers by 10 %.

Since 2009, the overall performance of the freight railway transport has increased again, mainly the performances of private freight carriers. Also intermodal transport branches out which influence right on the performances of railway transport. Railway freight transport is stagnant in most European countries currently. So another political factor which may affect its future development is the EU's efforts to solve this situation and to return the part of freight transport back to the railways so that the proportion was again 25 %. Establishing a single European railway corporation could achieve this goal.

Also, the investment to the infrastructure (modernization of railway lines and carriages), the improvement of competitiveness by market liberalization and the delivering new additional services give a presumption of increases in demand for transport by railway transport in the future.

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